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Closure Sampling and Analysis Plan for Building 241 Former Gasoline UST Site and Building 125 Former Heating Oil UST Site Los Angeles AFB, California

Prepared For

Air Force Center for Environmental Excellence
Brooks AFB, Texas

and

Los Angeles AFB, California

Parsons Engineering Science, Inc.

July 1995

9404 Genesee Avenue, Suite 140
La Jolla, California 92037

DRAFT

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SECTION 1

INTRODUCTION

This site closure sampling and analysis plan (SAP) has been prepared by Parsons Engineering Science, Inc. (Parsons ES) for submittal to the California Regional Water Quality Control Board - Los Angeles Region (RWQCB). The RWQCB has assumed oversight of underground storage tank (UST) work at military facilities from the Los Angeles County Department of Public Works (LACDPW), Waste Management Division.

During the past two years, Los Angeles Air Force Base (LA AFB) has participated in the Air Force Bioventing Pilot Test Initiative Project. Sponsored by the Air Force Center for Environmental Excellence (AFCEE) at Brooks AFB, Texas, the project included conducting more than 135 *in situ* bioventing pilot tests at 48 Air Force installations throughout the country. These tests were designed to collect data on the effectiveness of bioventing for the remediation of soil contaminated with fuel hydrocarbons (i.e., JP-4 jet fuel, diesel fuel, gasoline, heating oil, etc.). One-year-long bioventing pilot tests have recently been concluded at three LA AFB sites. Based on the results of these one-year tests, *in situ* bioventing has been effective enough to support closure of the Building 241 former 150-gallon gasoline UST and the Building 125 former 3,400-gallon heating oil UST sites at LA AFB. This SAP presents a plan for confirmation soil sampling to document the effectiveness of soil remediation at these two sites and to demonstrate compliance with regulatory requirements for closure.

This SAP consists of six sections, including this introduction. Section 2 includes site descriptions, histories, and summaries of previous investigations and remediation activities. Section 3 summarizes all applicable site closure requirements. A detailed site closure SAP is presented in Section 4. Analytical results will be presented in a site closure report as described in Section 5. Section 6 provides references cited in this SAP. It is anticipated that analytical results will support a no-further-action recommendation, and that the RWQCB will grant site closure.

SECTION 2

SITE DESCRIPTION AND HISTORY

LA AFB is located in El Segundo, California, approximately two miles south of Los Angeles International Airport. LA AFB lies north and south of El Segundo Boulevard, between Douglas Avenue to the west and the San Diego Freeway (405) to the east (Figure 2.1). In the immediate vicinity of LA AFB are other defense and aerospace industries, light to medium manufacturing/industrial facilities, and single-family homes to the south of the Base.

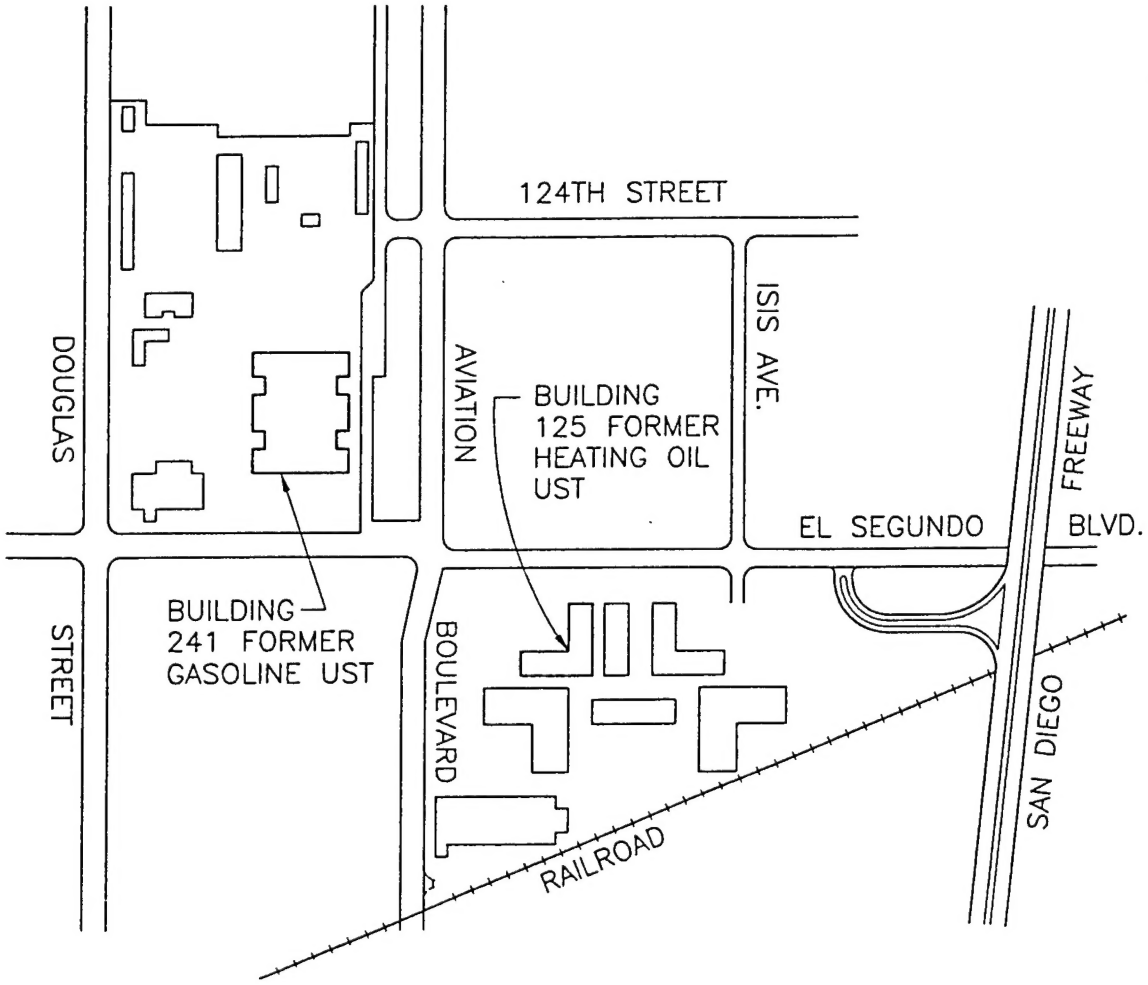
LA AFB is the space and missile center for the U.S. Air Force. Most of the facilities are office buildings, with some warehouse and maintenance shops, and a Base exchange center. The Base has no runway, aircraft, or related facilities. However, prior to becoming an Air Force base in the 1950s, defense contractors operated jet engine test facilities at the site.

2.1 BUILDING 241 FORMER GASOLINE UST SITE

Building 241, which houses a boiler facility, is currently active. The area surrounding the building is paved with concrete and asphalt. The site location is shown on Figure 2.1. The former 150-gallon gasoline UST is thought to have been installed in the mid-1950s. The tank was located immediately south of Building 241 (Figure 2.2). The UST was removed in August 1990 by TetraTech, Inc. (under LACDPW Hazardous Materials Division Closure Permit No. 7969, File No. I-10138-2C/15164-2N). The tank had visible signs of corrosion, and the fill pipe was disconnected from the tank (Mittelhauser Corporation, 1992a). Tank-bed soil samples collected during UST removal operations indicated the presence of total recoverable petroleum hydrocarbon (TRPH) contamination, and benzene, toluene, ethylbenzene, and xylene (BTEX) contamination. No additional excavation or investigation work was performed at that time. The excavation was backfilled with soil removed during the excavation, covered to grade with clean soil, and repaved with concrete.

2.2 BUILDING 125 FORMER HEATING OIL UST SITE

Building 125 is a restricted (security clearance required) office facility (Figure 2.1). The former 3,400-gallon heating oil UST was located under the asphalt parking lot adjacent to the perimeter planter, near the building entrance (Figure 2.3). Historic information for the tank is incomplete. It is believed that the tank was installed in the mid-1950s to 1960s. The tank was removed by TetraTech in early 1993. Because the



PARSONS ENGINEERING SCIENCE, INC. OFFICES IN PRINCIPAL CITIES PARSONS 9404 GENESEE AVENUE • SUITE 140 LA JOLLA, CA 92037 • (619) 453-9650	DESIGNED BY: LD DRAWN BY: MSB DATE: 5/16/95	FIGURE 2.1 SITE LOCATIONS LOS ANGELES AFB, CALIFORNIA

July 5, 1995 - 20:10:59 D:\ACAD\726876\FIG2-1.DWG

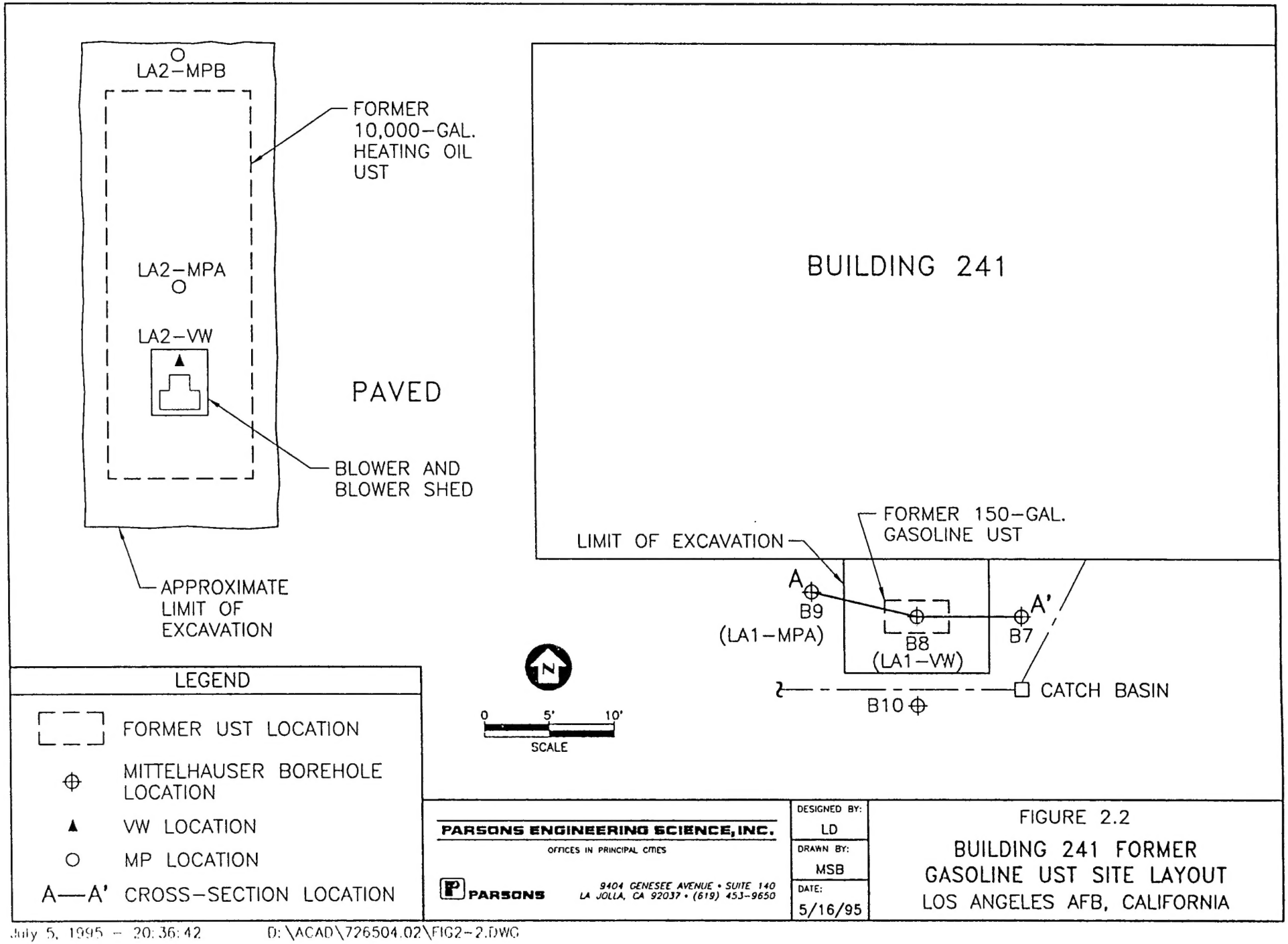

LA2–MPB
FORMER 10,000–GAL. HEATING OIL UST
LA2–MPA
LA2–VW
PAVED
BLOWER AND BLOWER SHED
APPROXIMATE LIMIT OF EXCAVATION
BUILDING 241
LIMIT OF EXCAVATION
FORMER 150–GAL. GASOLINE UST
A
B9
(LA1–MPA)
B8
(LA1–VW)
A'
B7
B10
CATCH BASIN
N
0 5' 10'
SCALE
LEGEND
FORMER UST LOCATION
MITTELHAUSER BOREHOLE LOCATION
VW LOCATION
MP LOCATION
A—A' CROSS–SECTION LOCATION
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FIGURE 2.2
BUILDING 241 FORMER GASOLINE UST SITE LAYOUT
LOS ANGELES AFB, CALIFORNIA
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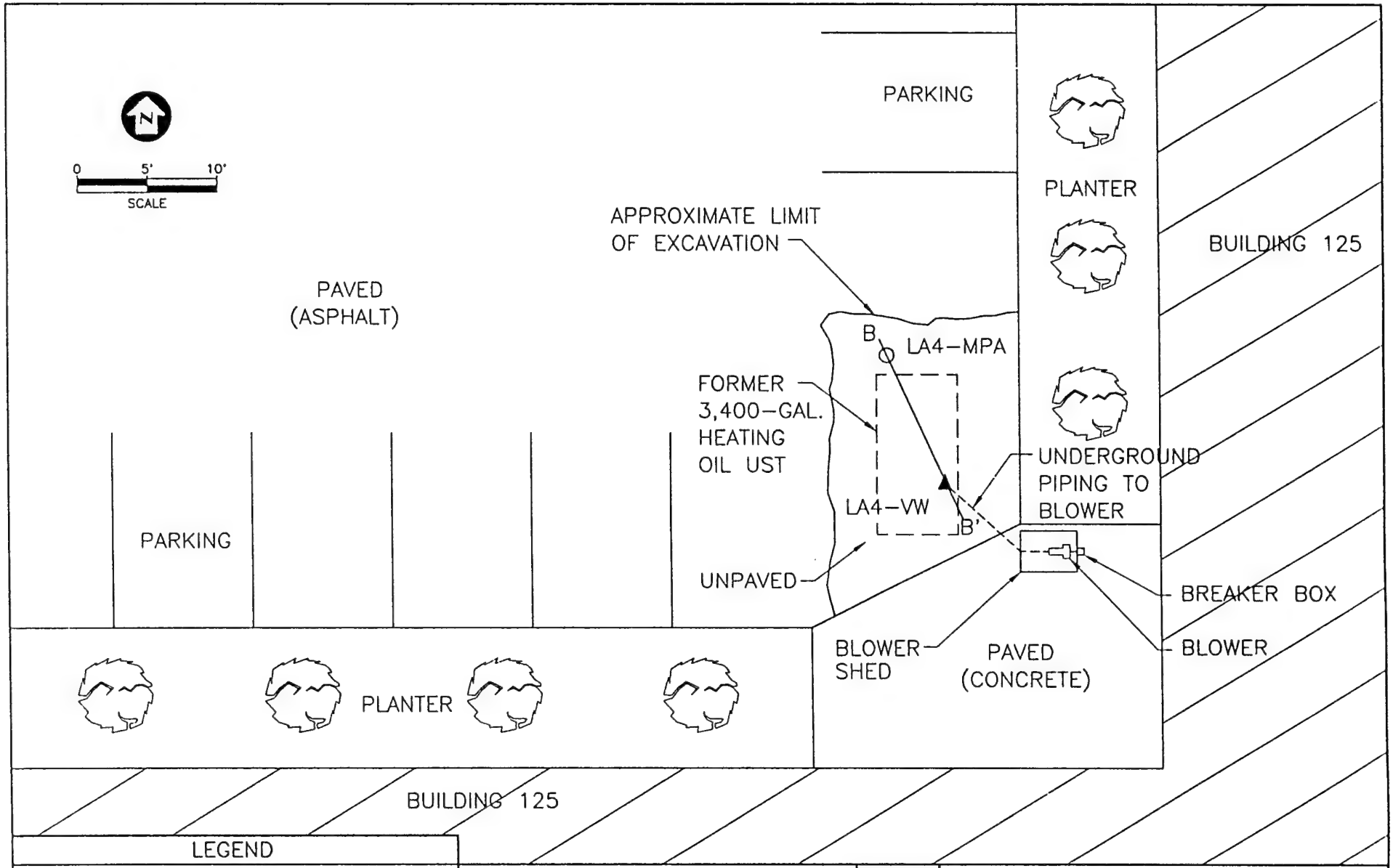

July 5, 1995 - 20:46:38 D:\ACAD\726876\FIG2-3.DWG

tank did not contain motor vehicle fuel, the LACDPW did not issue a removal permit or file number. One of two tank-bed soil samples collected during removal operations was found to contain total petroleum hydrocarbons (TPH), TRPH, ethylbenzene, and xylene.

2.3 SITE GEOLOGY

LA AFB is located in the western part of the Los Angeles Basin. The Los Angeles Basin is a relatively flat, low land area between the Santa Monica and San Gabriel Mountains to the north, and the Santa Ana Mountains to the south (TetraTech, 1992). The basin is filled with up to 20,000 feet of Miocene- to Recent-aged sediments.

Previous bioventing and site investigation activities have encountered four main soil units within the first 57 feet below ground surface (bgs). From just below paved surfaces to 10 to 12 feet bgs, a silty clay to clayey silt is encountered. This unit contains minor amounts of fine sand. From approximately 12 feet to 40 feet bgs is a well-sorted medium sand. Below this sand is a clay unit approximately 3 to 5 feet thick. A previous site investigation report describes this unit as being comprised of thin silt, sand, and clay subunits (TetraTech, 1992). Below this clay is another sand unit. This lower sand unit extends to at least 57 feet bgs.

2.4 SITE HYDROGEOLOGY

The depth to groundwater in well 1318N, located at the intersection of El Segundo and Nash, approximately 3,000 feet northwest of the sites, was measured at 96.5 feet bgs on March 20, 1990. During previous Base investigations, boreholes to depths of 57 feet bgs did not encounter groundwater. According to Base sources, the depth to groundwater in two monitoring wells last sampled in the early 1990s was approximately 90 feet bgs. These wells will be located and sounded during closure sampling activities described in Section 4. The updated groundwater depth data will be included in the site closure report.

2.5 PREVIOUS INVESTIGATIONS AT BUILDING 241 FORMER GASOLINE UST SITE

2.5.1 UST Removal: 1990

This 150-gallon tank was excavated and removed in August 1990 by TetraTech, Inc. Information such as the number of samples collected, sample locations, analytical method detection limits, and specific compounds detected were not available from records supplied by LA AFB. The Base reported that one tank-bed sample had a TRPH concentration of 760 milligrams per kilogram (mg/kg) and a total BTEX concentration of 6 mg/kg. The specific BTEX compounds detected were not reported.

2.5.2 Soil Investigation: 1992

Additional site characterization work was performed by the Mittelhauser Corporation in July 1992. Mittelhauser drilled and sampled four boreholes in and around the former UST excavation. Results of the investigation are detailed in their October 1992 *UST Investigation Report, Los Angeles Air Force Base.* Mittelhauser borehole locations are shown on Figure 2.2. Soil sampling results are presented in Table 2.1. Only the sample from 6 feet bgs in the borehole drilled through the former tank bed (borehole B-8) had TPH as gasoline (TPH-g as analyzed using U.S. Environmental Protection Agency (EPA) SW8015 Modified) and BTEX (using EPA Method SW8020) concentrations above detection limits. This sample had a TPH-g concentration of 1,850 mg/kg, and BTEX concentrations of 6.24 mg/kg, 31.8 mg/kg, 18.7 mg/kg, and 91.4 mg/kg, respectively (Table 2.1).

2.5.3 Bioventing: 1992-1995

During the 1992 Mittelhauser investigation, Parsons ES installed a bioventing air injection vent well (VW) and a vapor monitoring probe (MP) in boreholes B-8 and B-9, respectively. VW and MP locations are shown in Figure 2.2 and in the cross section on Figure 2.4. As described in the Parsons ES (1994) *Draft Bioventing Pilot Test Interim Results Report*, initial soil gas testing at the VW and MP indicated sufficient oxygen concentrations (>5 percent) to facilitate naturally occurring bioremediation. Therefore, the air injection blower originally planned for the VW was not installed.

Beginning in July 1993, Parsons ES conducted a bioventing pilot test at the nearby Building 241 former 10,000-gallon heating oil UST, located approximately 67 feet from the former gasoline UST (Figure 2.2). A VW and three MPs were installed at the former heating oil UST (Parsons ES, 1994). As part of the pilot test, an air permeability test and a respiration test were conducted at the former heating oil UST site. Air permeability testing indicated the former heating oil UST VW's zone of pressure and oxygen influence included the former gasoline UST area. The respiration test indicated hydrocarbon biodegradation rates of up to 2,800 mg of hydrocarbons per kg of soil per year in the more contaminated soil at the site.

Because of the relatively low initial TPH-g and BTEX concentrations at the former gasoline UST, and the beneficial effect of the nearby bioventing system, it is expected that the former gasoline UST site has been remediated to within regulatory cleanup levels. It is anticipated that TPH-g concentrations are at or below 100 mg/kg, and that BTEX concentrations are below detection limits. Therefore, it is anticipated that the results of the site closure soil sampling described in Section 4 will support site closure.

TABLE 2.1
SOIL SAMPLE ANALYTICAL RESULTS
BUILDING 241 FORMER GASOLINE UST SITE
LOS ANGELES AFB, CALIFORNIA

Sample Number	Sample Depth (ft bgs)[c/]	TPH - Gas[a/] EPA SW8015 Mod. (mg/kg)	EPA SW8020 BTEX (mg/kg)[b/]			
			Benzene	Toluene	Ethylbenzene	Xylenes
Detection Limits (mg/kg):		1	0.005	0.005	0.005	0.01
B7-2	11	ND	ND	ND	ND	ND
B7-2D	11	ND	ND	ND	ND	ND
B7-3	16	ND	ND	ND	ND	ND
B7-4	21	ND	ND	ND	ND	ND
B8-1	6	1,850	6.24	31.8	18.7	91.4
B8-2	11	ND	ND	ND	ND	ND
B8-4	21	ND	ND	ND	ND	ND
B8-6	31	ND	ND	ND	ND	ND
B8-8	41	ND	ND	ND	ND	ND
B8-D	41	ND	ND	ND	ND	ND
B9-1	6	ND	ND	ND	ND	ND
B9-2	11	ND	ND	ND	ND	ND
B9-4	21	ND	ND	ND	ND	ND
B9-6	31	ND	ND	ND	ND	ND
B9-8	41	ND	ND	ND	ND	ND
B10-2	11	ND	ND	ND	ND	ND
B10-3	16	ND	ND	ND	ND	ND
B10-4	21	ND	ND	ND	ND	ND

Source: Mittelhauser, 1992.

a/ TPH = total petroleum hydrocarbons - gasoline range; EPA = US Environmental Protection Agency.
b/ BTEX = benzene, toluene, ethylbenzene, and xylenes; mg/kg = milligrams per kilogram.
c/ ft bgs = feet below ground surface.

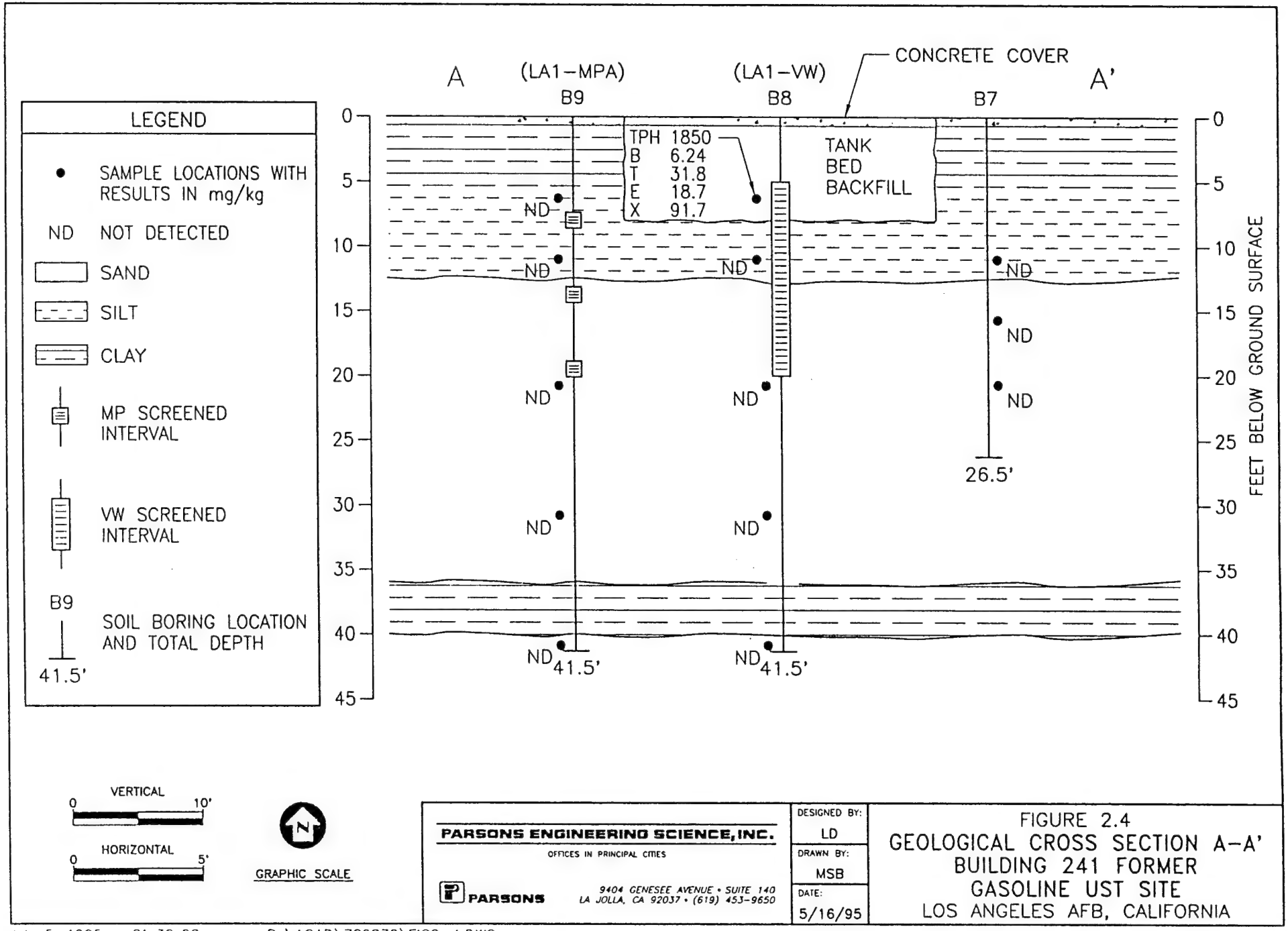
LEGEND
SAMPLE LOCATIONS WITH RESULTS IN mg/kg
ND NOT DETECTED
SAND
SILT
CLAY
MP SCREENED INTERVAL
VW SCREENED INTERVAL
B9
SOIL BORING LOCATION AND TOTAL DEPTH
41.5'
A
(LA1-MPA)
B9
(LA1-VW)
B8
B7
A'
CONCRETE COVER
TPH 1850
B 6.24
T 31.8
E 18.7
X 91.7
TANK BED BACKFILL
ND
26.5'
41.5'
0
5
10
15
20
25
30
35
40
45
FEET BELOW GROUND SURFACE
VERTICAL
0 10'
HORIZONTAL
0 5'
GRAPHIC SCALE
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FIGURE 2.4
GEOLOGICAL CROSS SECTION A-A'
BUILDING 241 FORMER
GASOLINE UST SITE
LOS ANGELES AFB, CALIFORNIA
July 5, 1995 - 21:32:00
D:\ACAD\726876\FIG2-4.DWG

2.6 PREVIOUS INVESTIGATIONS AT BUILDING 125 FORMER HEATING OIL UST SITE

2.6.1 UST Removal: 1993

The 3,400-gallon heating oil UST was removed in early 1993. Information provided by LA AFB (Michael Hanna) indicated one of the two tank-bed samples collected during removal operations had elevated TPH-d (EPA Method SW8015 Modified for diesel-range organics), TRPH, ethylbenzene, and xylene concentrations of 1,600 mg/kg, 4,300 mg/kg, 82 mg/kg, and 180 mg/kg, respectively.

2.6.2 Bioventing: 1993-1994

Beginning in July 1993, Parsons ES conducted bioventing pilot testing activities at the site of the former heating oil UST. As part of the pilot test, one VW and one MP were installed at the site. VW and MP locations are shown on Figures 2.3 and in cross section on Figure 2.5. Because the project focus was on bioventing, not site characterization, only limited soil sampling was performed. Three soil samples were collected from the VW and MP, and a soil gas sample was collected from the VW. Analytical results are presented in Table 2.2. Detailed pilot testing procedures and results are presented in the bioventing report (Parsons ES, 1994). Initial testing indicated that site contamination extended from directly beneath the former UST to approximately 35 feet bgs, at which depth a clay layer was encountered. MPA, located 10 feet from the VW, had only moderate field evidence of contamination in one sample collected from tank-bed backfill material. A respiration test conducted in the VW indicated a hydrocarbon reduction rate of approximately 1,380 mg of hydrocarbons per kg of soil per year. The air permeability test indicated that a 2.3-cubic-foot-per-minute air injection pump would provide sufficient oxygen to treat the area of contamination as defined during the pilot test.

Long-term air injection at the Building 125 former heating oil UST site began in December 1993 and continued until December 1994. Year-end sampling completed in January 1995 indicated a 99.9 percent reduction in TVH in the soil gas sample and TRPH reductions of 83 percent and 57 percent in two of the three soil samples (Table 2.2). The year-end respiration test indicated a hydrocarbon biodegradation rate of approximately 1,000 mg/kg per year. Following year-end testing, the blower was restarted and is currently injecting air into the VW. Based on the encouraging year-end sampling and testing results, it is anticipated that site TRPH concentrations are below 1,000 mg/kg, and the BTEX concentrations are below detection limits. It is also anticipated that results of the site closure soil sampling described in Section 4 will support site closure.

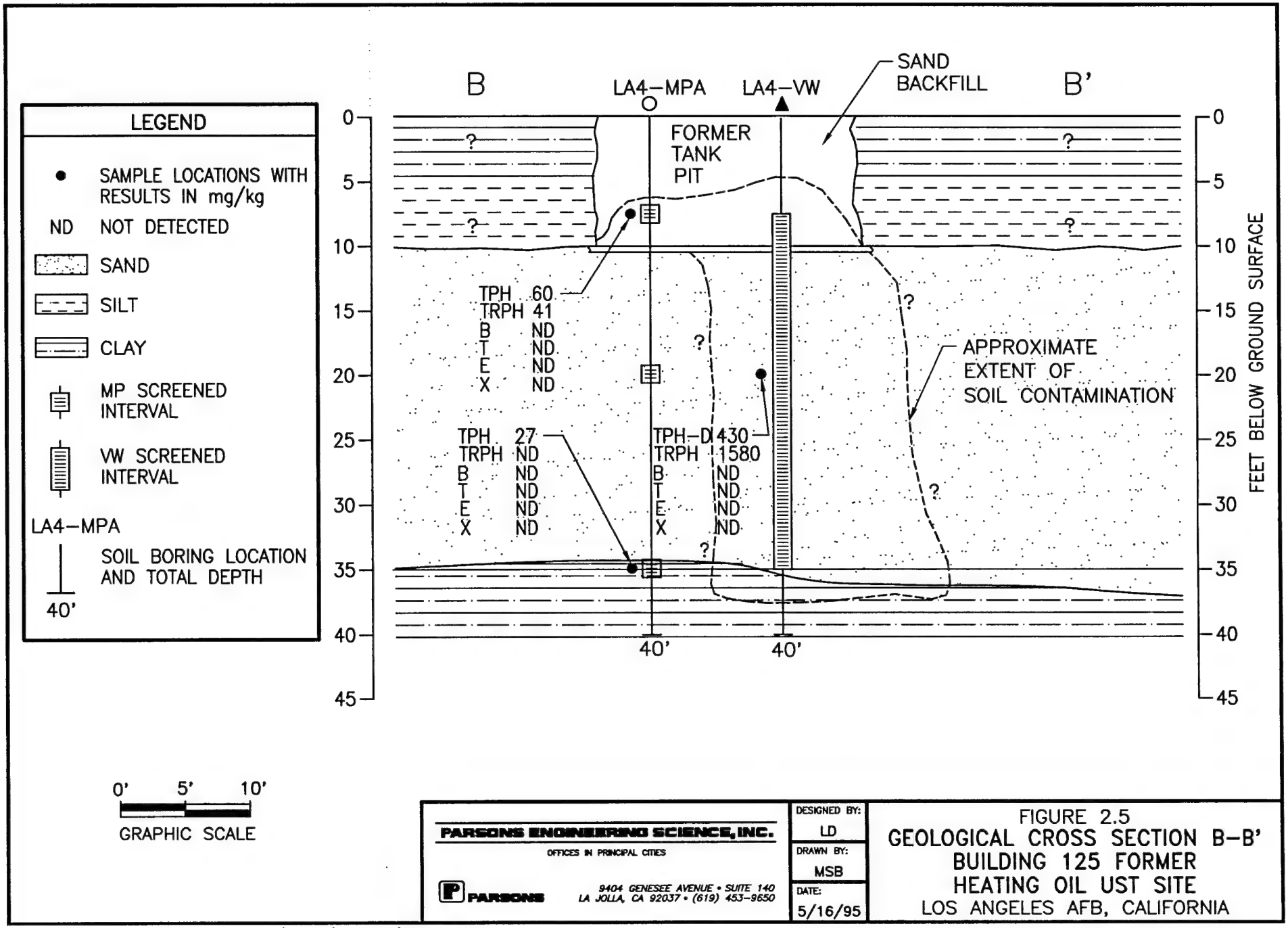

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FIGURE 2.5
GEOLOGICAL CROSS SECTION B–B'
BUILDING 125 FORMER
HEATING OIL UST SITE
LOS ANGELES AFB, CALIFORNIA

July 5, 1995 – 21:38:56 D:\ACAD\726876\FIG2–5.DWG

TABLE 2.2

SOIL AND SOIL GAS SAMPLE ANALYTICAL RESULTS
BUILDING 125 FORMER HEATING OIL UST SITE
LOS ANGELES AFB, CALIFORNIA

Analyte (Units)[a/]	Sample Location - Depth (Feet Below Ground Surface)	
	Initial	Year-end
Soil Gas Hydrocarbons	**LA4-VW**	**LA4-VW**
TVH[b/] (ppmv)	2,200	.7
Benzene (ppmv)	ND (0.051)[c/]	ND (0.002)
Toluene (ppmv)	ND (0.051)	ND (0.002)
Ethylbenzene (ppmv)	0.089	ND (0.002)
Xylenes (ppmv)	0.20	0.015

	Initial	Year-end	Initial	Year-end	Initial	Year-end
Soil Hydrocarbons	**LA4-VW-20'**	**LA4-VW-20'**	**LA4-MPA-7'**	**LA4-MPA-7'**	**LA4-MPA-35'**	**LA4-MPA-35'**
TPH-D[d/] (mg/kg)	430	NA[e/]	60	NA	27	NA
TRPH[f/]	1,580	274	41	17.8	ND (11)	34.9
Benzene (mg/kg)	ND (0.002)	ND (0.05)	ND (0.0003)	ND (0.05)	ND (0.0003)	ND (0.05)
Toluene (mg/kg)	ND (0.002)	ND (0.05)	ND (0.0003)	ND (0.05)	ND (0.0003)	ND (0.05)
Ethylbenzene (mg/kg)	ND (0.002)	ND (0.05)	ND (0.0003)	ND (0.05)	ND (0.0003)	ND (0.05)
Xylenes (mg/kg)	ND (0.004)	ND (0.10)	ND (0.0007)	ND (0.10)	ND (0.0007)	ND (0.10)

Source: Parsons ES, 1994

a/ ppmv = parts per million, volume per volume; mg/kg = milligrams per kilogram
b/ TVH = total volatile hydrocarbons referenced to jet fuel (Molecular weight = 156).
c/ ND = Not detected, detection limit given in parentheses.
d/ TPH-D = total petroleum hydrocarbons as diesel fuel by EPA SW8015 Modified.
e/ NA = Not analyzed.
f/ TRPH = total recoverable petroleum hydrocarbons by EPA 418.1.

SECTION 3

SITE CLOSURE REQUIREMENTS

In February 1995 the California RWQCB, Los Angeles Region, released its Interim Site Assessment and Cleanup Guidebook. Site assessment and cleanup guidance is included in Volume I of the guidebook. The guidebook sets specific numerical cleanup goals based on type of contaminant, depth to ground water and potential use of ground water (i.e. drinking water).

3.1 SITE CHARACTERIZATION REQUIREMENTS

Specific requirements such as sampling protocol, sample depths and analytical methods are not included in the guidebook. However, the California RWQCB requires development of a Site Assessment Work Plan where site specific activities are described. Typically, the Site Assessment Work Plan is submitted for approval before field investigation work begins. Based on the results of implementing the work plan, a corrective action plan is typically developed.

Because the plans described above were not developed for these bioventing pilot tests, the California RWQCB, Los Angeles Region, was contacted in May 1995 to determine the appropriate course of action. The characterization activities completed at the Building 241 Former Gasoline UST Site and by Mittelhauser in 1992 and the sampling planned for the Building 125 Former Heating Oil UST Site (described in Section 4) were explained to the agency. The RWQCB gave tentative approval to go ahead with closure sampling activities (pending approval of this plan).

3.2 STATE SOIL CLEANUP STANDARDS

Soil cleanup standards for petroleum-impacted sites are presented in Section 5 of the guidebook and in Table 3.1. Depth to groundwater at the LA AFB is approximately 90 feet bgs and is considered to be drinking water by the California RWQCB. Therefore, Level B cleanup standards apply to both sites.

TABLE 3.1

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD SOIL CLEANUP STANDARDS (MG/KG OR PPM)

	Distance Above Groundwater (ft)		
	<40	40-150	>150
ABOVE DRINKING WATER	**LEVEL A**	**LEVEL B**	**LEVEL C**
BTEX + FA	MCL	10 MCL	100 MCL
TPH (Carbon Range)			
C4 - C12	10	100	1000
C13 - C22	100	1000	10000
C23 +	1000	10000	10000

ABOVE NON-DRINKING WATER	**LEVEL D (FOR ANY DEPTH TO GROUNDWATER)**
BTEX + FA	100 MCL
TPH (Carbon Range)	
C4 - C12	1000
C13 - C22	10000
C23 +	15000

Source: RWQCB, 1995.

MCLS: B = 0.001 (ppm), T = 0.1 (ppm), E = 0.68 (ppm), X = 1.75 (ppm), Pb = 0.015 (ppm), EDB + 0.02 (ppb),
PAH = 0.2 (ppb)

- BTEX = Benzene, toluene, ethylbenzene, and xylenes, respectively.
  TPH = Total petroleum hydrocarbons.
  FA = Fuel additives, lead (Pb), ethylene dibromide (EDB), etc., including other components (i.e., PAH) of petroleum products which have MCLs.
- Use of this table assumes the original source has been removed and an adequate site assessment has been completed.
- For BTEX or FA, each component is not to exceed 1, 10, or 100 times its MCL as specified.
- For TPH, the total allowable for each range is not to be exceeded and the overall total is not to exceed the given value for the heavier TPH (C23+).
- Soil levels below the appropriate levels in this table require no action, soil levels above the appropriate levels in this table must be remediated to or below provided levels, or a site-specific analysis must be conducted, or justification provided to determine more appropriate levels for an individual site. Groundwater monitoring may be required if soil contamination linkage to groundwater impact has been confirmed.
- BTEX to be analyzed by EPA Method 8020, or EPA Method 8260 (usually to confirm positive benzene).
- TPH to be analyzed by EPA Methods 418.1 and 8015 (Modified). Ranges of TPH to be analyzed by GC/MS carbon range methods or EPA Method 8015 (DHS Modified). PAH to be analyzed by EPA Method 8310.
- Use of Non-Drinking Water Levels are dictated by either water characteristics as defined and exempted under SWRCB Resolution 88-63 (TDS >3000 mg/L, deliverability <200 gal/day, or existing contamination that cannot be reasonably treated), or as agreed upon by Regional Board staff for use at a particular site.
- Minimum clean interval below impacted area to be determined on a site-specific basis by Regional Board staff, generally 40' above drinking waters and 20' above non-drinking waters.

SECTION 4

SITE CLOSURE SAMPLING AND ANALYSIS PLAN

The following SAP describes the borehole locations and sampling depths, soil sampling procedures, and analytical methods proposed to collect sufficient data to support site closure. This plan has been prepared and will be implemented by, or under the direct supervision of, a California Registered Geologist as required by the California RWQCB (1995) Interim Site Assessment and Clean-up Guidebook (see Section 3).

4.1 SITE CLOSURE BOREHOLE LOCATIONS AND SAMPLING DEPTHS

4.1.1 Building 241 Former Gasoline UST Site

As described in Section 2, this site was adequately characterized during the 1992 Mittelhauser investigation. Soil contamination was limited to the immediate vicinity of the former tank at 6 feet bgs. Parsons ES proposes to drill an additional borehole through the center of the former tank bed, approximately 1 to 2 feet from the VW (B8) (see Figure 2.2). Soil samples for laboratory analysis will be collected at 4, 6, and 8 feet bgs. If the 8-foot sample has any field evidence of contamination (e.g., odor, staining, or above-background photoionization detector (PID) and total hydrocarbon vapor analyzer (THVA) readings) additional samples will be collected at 2-foot intervals until field evidence of contamination is not detectable. Soil samples will be collected and analyzed as described in Subsections 4.2 and 4.3, respectively.

In the unlikely event that analytical results indicate additional site remediation is required, the VW and MP will not be abandoned at this time. Should site closure be granted, arrangements will be made to properly abandon the VW and MP.

4.1.2 Building 125 Former Heating Oil UST Site

To confirm that the extent of site contamination has been adequately characterized and remediated to within acceptable levels, Parsons ES proposes to drill and sample four additional boreholes. Proposed borehole locations are shown on Figure 4.1. To establish the maximum depth of contamination, the first borehole will be drilled through the center of the former tank bed. Samples for chemical analysis will be collected at 5-foot intervals, from 5 feet bgs to a minimum of 40 feet bgs, approximately 3 feet into the clay (see Figure 2.5). If the 40-foot sample has field

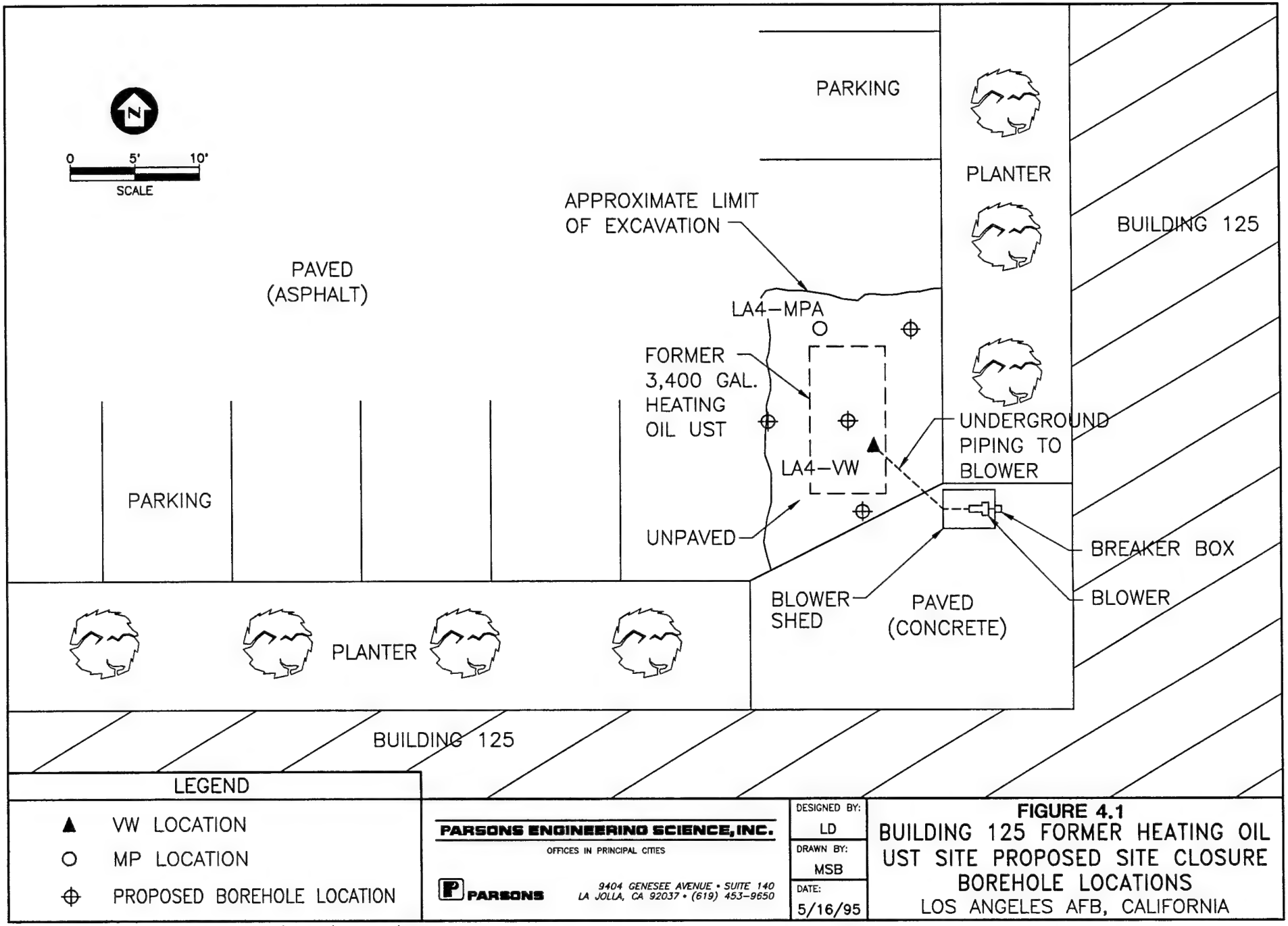

FIGURE 4.1
BUILDING 125 FORMER HEATING OIL UST SITE PROPOSED SITE CLOSURE BOREHOLE LOCATIONS
LOS ANGELES AFB, CALIFORNIA

Jul 05, 1995 – 16:44:33 D:\ACAD\726876\FIG3-1.DWG

evidence of contamination, sampling will continue at 5-foot intervals until such field evidence is no longer present.

The remaining boreholes will be drilled and sampled at 5-foot intervals to the same depth as the first borehole. In these three boreholes, only samples with field evidence of contamination will be retained for laboratory analysis. To confirm non-detect field screening results, at least four samples from each borehole, including the deepest sample, will be retained for laboratory analysis. Soil samples will be collected and analyzed as described in Subsections 4.2 and 4.3, respectively.

In the unlikely event that analytical results indicate additional site remediation is required, the VW and MP will not be abandoned at this time. Should site closure be granted, arrangements will be made to properly abandon the VW and MP.

4.2 DRILLING, SAMPLING, AND EQUIPMENT DECONTAMINATION

Boreholes will be advanced using a drill rig equipped with 6-inch outside-diameter (OD) hollow-stem augers. Soil cuttings generated during drilling will be placed in US Department of Transportation (DOT)-approved, 55-gallon drums. The drums will be labeled with the site name, drilling date, borehole number, and depth intervals. To minimize cuttings disposal costs, cuttings showing no field evidence of contamination will not be drummed with contaminated cuttings (i.e., soil with above-background PID and TVHA readings, petroleum odor, or discoloration). Boreholes will be logged by a Parsons ES geologist. Soil types will be classified according to the Unified Soil Classification System (USCS) and described in accordance with the standard Parsons ES soil description format.

Before use and between boreholes, augers and other downhole equipment will be cleaned to prevent cross-contamination. Cleaning will be accomplished using a high-pressure hot-water wash, followed by a potable water rinse. Decontamination fluids will be collected and contained in labeled 55-gallon drums.

Relatively undisturbed soil samples, suitable for chemical analysis, will be collected at approximately 2- to 5-foot intervals unless specified otherwise. Soil samples will be collected in a 2.5-inch inside-diameter (ID) split-barrel sampler that will be lowered through the hollow stem of the augers and driven approximately 1.5 foot (or to refusal, if shallower) into undisturbed soil, ahead of the augers. Between sampling events, the spilt-barrel sampler will be cleaned with Alconox, detergent, followed by successive potable and distilled water rinses.

The split-sampler will be fitted with three precleaned, 2.5-inch OD by 6-inch-long, thin-walled, brass sleeves. Before samples are collected, sample sleeves will be cleaned using the same procedure as that for the sampler. After collection of a sample, the sampler will be retrieved, split apart, and the sleeves will be removed. The ends of

the lowest sleeve that contains the sample for chemical analysis will be covered with Teflon, sheets and plastic end caps.

The upper sample sleeves will be used for logging purposes, and will be screened in the field for organic vapors using a PID and a TVHA. The data obtained from the logging and screening will be recorded on the borehole logs.

The sleeves for chemical analysis will be labeled with the site name and borehole number, sample depth, date of collection, project name, and other pertinent data. These sleeves will be placed immediately in an insulated shipping container with ice, and will be maintained in a chilled condition until delivered to the analytical laboratory. Chain-of-custody records will be prepared in the field and will accompany the samples to the analytical laboratory.

4.3 SOIL SAMPLE ANALYSIS

Proposed sample analytical methods and detection limits are presented in Table 4.1. All samples will be analyzed by a State of California-certified and AFCEE-approved Laboratory.

Parsons ES proposes to analyze samples from the Building 241 former gasoline UST site by EPA Method SW8015 Modified for TPH as gasoline, by EPA Method 7421 for lead, and by EPA Method SW8020 for BTEX. Proposed analyses for the Building 125 former heating oil site will include EPA Method 418.1 for TRPH, EPA Method SW8015 Modified for TPH (as extractable fuels), and EPA Method SW8020. TPH results for both sites will be reported for each carbon chain (i.e., C4-C23+). This will allow for comparison with greater accuracy to California RWQCB (1995) clean-up standards listed in the *Interim Guidance For Remediation of Petroleum Impacted Sites* (see Subsection 3.2).

TABLE 4.1

PROPOSED SOIL SAMPLE ANALYTICAL METHODS AND PRACTICAL QUANTITATION LIMITS

Analytical Method	PQL (mg/kg)[a/]
Building 241 Former Gasoline UST Site	
EPA SW8015 Modified for Gasoline[b/] (California Department of Health Services Method)	1.0
EPA 7421 for Lead	0.5
EPA SW8020	
Benzene	0.001
Toluene	0.005
Ethylbenzene	0.005
Xylenes	0.05
Building 125 Former Heating Oil UST Site	
EPA 418.1 TRPH	5.0
EPA SW8015 Modified for Extractable Fuels[b/]	5.0
EPA SW8020	
Benzene	0.001
Toluene	0.005
Ethylbenzene	0.005
Xylenes	0.05

a/ PQL = practical quantitation limit; mg/kg = milligrams per kilogram

b/ Results will be reported for each carbon chain using the simulated distillation method.

SECTION 5

SITE CLOSURE REPORT FORMAT

Following receipt of the laboratory analytical results, a site closure report will be prepared and submitted to the California RWQCB, LA AFB, and AFCEE.

The report will contain the following information for each site:

- Plot plans showing final borehole locations;
- Summary of field activities;
- Assessment of analytical results in comparison to state cleanup criteria;
- Laboratory analytical reports and chain-of-custody forms;
- Borehole logs; and
- Conclusions and recommendations for site closure or additional cleanup action.

The report will be prepared and signed by a California Registered Geologist.

SECTION 6

REFERENCES CITED

California Regional Water Quality Control Board, Los Angeles Region, (RWQCB). 1995. *Interim Site Assessment and Clean-up Guidebook*. Vol I. February.

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